

PETERSON (F.)

*Electrothanasia.*





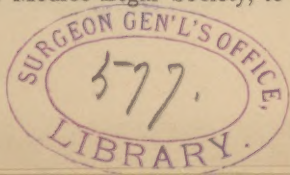
## ELECTROTHANASIA.

By FREDERICK PETERSON, M.D.

EVER since the passage of the law in this State requiring the use of electricity as a means of capital execution, there has been much discussion as to the method of employing it, the apparatus, human resistance, the possibility of killing at all, etc. I say *since* the passage of the law, for, singularly enough, the method was legally adopted before any practical point had been settled with regard to electrothanasia (the writer would suggest the use of this word in the place of such a barbarous term as "electrocution," which appears in some of the daily papers). The commission that drafted the law had a few dogs killed at Buffalo in the following manner: They were partly immersed in a zinc-lined box containing water, which served as one pole; the wire of the other pole was inserted into the mouth or wound around the nose. The current was furnished from an electric light wire. It was upon such experiments as these that the new law was based! As to the electromotive force, the resistance, the current strength, the kind of current used, not one of these facts seems to have been known or noted.

In the summer of 1888, Mr. H. P. Brown, a practical electrician of this city; Mr. A. E. Kennelly, chief electrician of the Edison Laboratory, and the writer, made a large number of careful experiments upon lower animals, but not for the purpose of determining any facts concerning the employment of lethal currents in execution.

One object was to study the well-known differences between high-tension continuous and alternating currents, both of which have been fatal to many human beings in this country, and whose dangerously high voltage has been limited by law in England and France; and another object was to observe the physiological and pathological effects of death-currents (*Electrical World*, August 11, 1888). In all, some twenty-four dogs were killed. Subsequently the writer was made chairman of a committee of the New York Medico-Legal Society, to report upon





the best method of execution by electricity, and the experiments already undertaken were found to have valuable application in a study of this subject. Additional experiments were conducted before this committee and a number of State prison officials, several calves and horses being killed. The committee then recommended, in legal procedures, the application of good-sized, metallic, sponge-covered electrodes to the head and spine, after careful saturation of the skin and sponges with a warm saline solution; the use of a 3,000 volt dynamo, and a current potential of 1,000 to 1,500 volts, alternating 300 times per second, for a period of time, from fifteen to thirty seconds.

There is no doubt that the current thus applied will kill in every instance without regard to human resistance, and that unconsciousness, and cessation of pulmonary and ventricular movements will be instantaneous.

The objections, upon the ground of enormous human resistances, so ably set forth by Dr. Sachs, in his letters to *THE MEDICAL RECORD* of July 27th and August 17th, can be met by accurate statements of facts already known.

In the first place, the writer does not dispute the correctness of Jolly and Gärtner in their determination of resistances in the human body amounting to as much occasionally as one-half of a megohm; but it must be borne in mind that this resistance is the initial resistance to exceedingly small electromotive forces, even as low as one volt, to which even less than 500,000 ohms would seem to be almost complete insulation. The strong current referred to by Dr. Sachs as reducing the resistance of the feet from 22,000 S units to 20,000 in a minute, had certainly not over forty volts as its electromotive force.

Now it is a fact that the greater the electromotive force the more rapidly is resistance reduced, and this is especially true of interrupted and alternating currents. For instance, the primary current of a faradic battery, which is an interrupted, and the secondary, which is an alternating current—neither one of these appears to meet with much resistance in the human body, for after the skin and electrodes are moistened the effect upon the sensory-motor apparatus of closing the circuit is so instantaneous that one almost questions whether there is any resistance at all. To be sure the electromotive force is quite high in

a faradic battery, as it is multiplied by every turn of the coils, and this may explain the sudden overcoming of resistance. The writer is not aware of any special study having been made of resistance in connection with faradic currents, with interrupted galvanic currents, or with "voltaic alternatives," which, if made to occur two to three hundred times per second would be our industrial alternating current. But the animals sacrificed last summer were carefully measured as to their resistances, and some of the facts then obtained have value as an argument here:

A dog with 7,500 ohms resistance took 800 volts of a continuous current for two seconds. During the two seconds the index of the ammeter rose rapidly to 1 ampère, which was as high as the instrument was made to register. Hence the resistance dropped from 7,500 to 800 ohms, or less, in two seconds. Another dog, with 6,000 ohms resistance, received one instantaneous shock of a 1,000 volt continuous current. The ammeter gave its full register of 1 ampère. Hence here was an instantaneous fall from 6,000 to 1,000 ohms, or less. A third animal, with 27,500 ohms resistance, received 160 volts of an alternating current for five seconds, causing immediate death. As the ammeter could not be used with this form of current, we were unable to determine the current strength. But surely the resistance must have been enormously reduced in five seconds,  $\frac{160}{27500} = \frac{16}{2750} = \frac{1}{171.8}$ , or nearly 6 milliampères, which of course did not kill the animal. Supposing even that as little current as one-tenth of an ampère killed the dog, we have a fall in five seconds from 27,500 to 1,600 ohms!

Further instances need not be cited, but attention should be called to the fact that the resistances of these dogs, as given, must be considered as minimal rather than maximal, and do not therefore represent the much larger initial resistances that these strong currents overcame at the first instant of closing the circuit.

As regards differences in resistance between man and the lower animals, they cannot be great, and must be due to analogous causes. In dogs, calves, and horses, the resistance was found to vary between 1,300 and 200,000 ohms, while in man it has been shown to vary from some 600 to some 500,000 ohms. Bones, muscles, saline fluids,

viscera, do not differ so much in the human and lower species that these resistances can be said to be due to variation in their composition; but the skins containing these tissues do vary widely in thickness, blood and sweat supply, and hairy and epidermal coverings, not only in various species of animals, but in different parts of any individual of any species. At the same time, minimal resistances do not differ greatly between men, provided similar parts be subjected to the same treatment for the purpose of measurement.

The experiments made by Mr. Kennelly recently for Mr. Edison were conducted upon three hundred persons. The hands were immersed in very dilute KHO as far as the wrist, and every measurement was taken as nearly as possible thirty seconds after the beginning of the passage of the current. No resistance exceeded 2,000 ohms, the average being 1,000. Doubtless the initial resistances, say in the first two or three seconds, would have been vastly higher with the small voltage employed; yet could anyone say that a 1,500 volt continuous current would not have been dangerous to life under these same conditions to every one of these three hundred persons during the first five seconds of contact? And if, instead of a continuous current, a 1,500 volt interrupted current, or 300 "voltaic alternatives" per second from a 1,500 volt dynamo had been used, could anybody bring forward one single fact to prove that death would not have taken place in every instance within ten or fifteen seconds?

These facts have been adduced by the writer from an impartial stand-point, for he would disclaim looking with any favor upon electrothanasia as an ideal method of legal execution; and, indeed, is opposed to it, but upon other grounds than its uncertainty.

It is absolutely certain, if the apparatus and circuit are in perfect order. But the tetanic rigidity into which the victim is always thrown, the relaxation of the sphincters of the bladder and rectum generally occurring during the contact, and the necessity of extraordinary care in the arrangement of the apparatus by an expert electrician, render it far from a desirable means for the legal extinction of human life.





